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Incidence of Decay Fungi in Stumps of Two Thinned Western Larch Stands in Northeastern Oregon

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Abstract

Incidence of decay fungi was measured in stumps from two thinned western larch (*Larix occidentalis* Nutt.) stands (9 and 15 years after thinning), one precommercially thinned and one commercially thinned, in northeastern Oregon. Ten species of decay fungi were positively identified from 180 stumps. Two root pathogenic species, *Heterobasidion annosum* (Fr.) Bref. and *Armillaria obscura* (Pers.) Herink Roll-Hansen, were found at relatively low frequencies. Most of the decay in the stumps was caused by either *Fomitopsis pinicola* (Swartz ex Fr.) Karst. or *Trichaptum abietinum* (Dicks. ex Fr.) Ryv., which normally are saprophytic wood decomposers.

Keywords: Decay fungi, thinning, western larch, Oregon.

Introduction

Root diseases are important causes of damage in Pacific Northwest forests, especially in stands with multiple harvest entries. Silvicultural practices designed to reduce stand density and favor shade intolerant conifer species have been recommended to decrease stand susceptibility to root diseases in Oregon and Washington (Hadfield and others 1986). Stumps created by thinning, however, may serve as inoculum sources to infect residual trees. Incidence of root pathogens, particularly *Heterobasidion annosum* (Fr.) Bref. (=*Fomes annosus* (Fr.) Cke.), in stumps created by thinning ponderosa pine (*Pinus ponderosa* Dougl. ex Laws.) has been reported in eastern Oregon and Washington (Russell and others 1973, Thies 1979). Although incidence of root pathogens or decay fungi in stumps created by thinning of western larch (*Larix occidentalis* Nutt.) stands has not been reported, incidence of decay fungi in roots and butts of living larch has been reported. Chacko and Partridge (1976) and Hobbs and Partridge (1979) sampled excavated root systems of living western larch in northern Idaho and found several species of decay fungi: *Armillaria* sp., *Phellinus nigrolimitatus* (Rom.) Bourd. et Galz., *P. weirii* (Murr.) Gilbertson, *P. pini* (Brot. ex Fr.) A. Ames, *Resinicium bicolor* (Alb. et Schw. ex Fr.) Parm., *Coniophora puteana* (Shum. ex Fr.) Karst., and *Ceriporiopsis rivulosa* (Berk. et Curt.) Gilbn. et Ryv.

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To determine the incidence of root pathogens and other decay fungi in stumps of western larch in a precommercially thinned stand and a commercially thinned stand, we explored the observation that the proportion of stumps infected by root pathogens is relatively low in larch stands compared with the incidence of root pathogens in thinned stands of true fir.

Methods

One study area is about 25 km southeast of Union, Oregon, on the La Grande Ranger District, Wallowa-Whitman National Forest: elevation, 1200 to 1350 m; slope, 5 to 20 percent; aspects, N and NW. Vegetation is typical of the *Abies grandis/Calamagrostis rubescens* plant community (Franklin and Dyrness 1973). The stand of western larch was 33 years old in 1966, with a quadratic mean diameter at breast height (d.b.h., 1.4 m) of 11.4 cm and a site index of 24 m at age 50. The study area supports a levels-of-growing-stock study designed for thinning at 10-year intervals (Seidel 1982). The stand was precommercially thinned in 1966 and again in 1976. From 1976 to 1980, a light-to-moderate infestation of larch casebearer (*Coleophora laricella* Hübner) was present on all plots.

The second study area is about 10 km northwest of Elgin, Oregon, on land owned by the Boise-Cascade Corp.: elevation, 900 m; slope, 5 percent; aspect, E. The western larch stand on the study area is a seral stage of an *Abies grandis/Pachistima myrsinites* plant community (Franklin and Dyrness 1973). The stand was 55 years old in 1970, with a quadratic mean d.b.h. of 22.5 cm and a site index of 25 m at age 50. The study area was originally used for a levels-of-growing-stock study designed for thinning at 10-year intervals (Seidel 1980). The stand was commercially thinned in 1970 and again in 1980. Infestation by the larch casebearer reduced height growth of larch in all plots. Some parts of the stand have severe infestations of dwarf mistletoe *Arceuthobium laricis* (Piper) St. John).

In October 1985, 100 stumps in the precommercially thinned stand and 80 stumps in the commercially thinned stand were selected randomly, with no restrictions on stump diameter. Stumps sampled in the precommercially thinned stand and the commercially thinned stand had mean diameters inside bark of 16.8 cm (range 9.0-30.6) and 17.7 cm (range 8.2-37.7), stump ages of 38.0 yr (range 23-46) and 47.7 yr (range 16-90), and percentage of stump surface area having visible decay of 56.2 (range 5-100) and 57.6 (range 5-100), respectively. Only stumps that had been cut for 9 years (second thinning) were sampled in the precommercially thinned stand because the 19-year-old stumps (first thinning) had deteriorated too much. Only stumps that had been cut for 15 years (first thinning) were sampled in the commercially thinned stand because there were too few 5-year-old stumps (second thinning) for an adequate sample. Presence of sporophores on each sampled stump was recorded. All dead trees within the stand were examined for cause of mortality by partially excavating major roots and dissecting roots to detect root pathogens.

The top portion from each stump was removed with a chainsaw and discarded. A disk (2-4 cm thick) was cut as close to the ground line as possible, and all loose bark was removed. Each disk was placed in a plastic bag with a numbered tag, transported to the laboratory, and refrigerated until disks were processed--within 1 week. In the laboratory, disks were washed with water and split aseptically with a flamed chisel. Five wood chips from each disk were removed aseptically from the margin between clear wood and stained or decayed wood. Each chip was placed in a culture tube containing 2 percent malt agar amended with 1 p/m of benomyl. Tubes were incubated in the dark at room temperature for 6 weeks. Attempts were made to identify all decay fungi to species by colony morphology and growth on selective media. Only stumps with positively identified fruiting bodies or cultures were recorded as infected.

Results and Discussion

Ten species of decay fungi isolated from larch stumps were positively identified (table 1). Only one potentially pathogenic species, *Heterobasidion annosum*, was positively identified in either study area, but at low frequencies: 6 percent of the stumps in the precommercially thinned stand and 5 percent in the commercially thinned stand. A second root pathogen, *Armillaria obscura* (Pers.) Herink Roll-Hansen (=*A. mellea sensu lato*), was observed fruiting and causing some decay in both stands, but no positive identifications were made from sampled stumps. Mortality of residual trees associated with either pathogen was infrequent in both stands and was found only in trees weakened by dwarf mistletoe or top breakage.

Table 1--Incidence of decay fungi in stumps of western larch cut 9 years ago (precommercial thinning) and 15 years ago (commercial thinning) in northeastern Oregon

Species of fungi	Precommercial thinning Number of stumps out of 100	Commercial thinning Number of stumps out of 80
Heterobasidion annosum	6	4
Fomitopsis pinicola	5	5
Trichaptum abietinum	7	2
Resinicium bicolor	1	1
Serpula himantioides	1	0
Coniophora arida	1	0
Wolfiporia cocos	1	1
Stereum sanguinolentum	1	1
Antrodia serialis	1	0
Trametes versicolor	0	1
Unidentified species 1	1	0
Unidentified species 2	1	0
Unidentified species 3	4	6

Incidence of *H. annosum* or *A. obscura* in larch stumps was relatively low compared with incidence in a thinned stand of grand fir (*Abies grandis* (Dougl. ex D. Don) Lindl.) within 30 km. In this stand, 71 and 29 percent of 100 stumps after 12 years were infected by *A. obscura* and *H. annosum*, respectively (G. Filip, unpublished data). Root diseases have been shown to cause severe mortality in grand fir stands in eastern Oregon and Washington (Filip and Goheen 1984) and northern Idaho and Montana (Hagle and Goheen, in press). Our data support management recommendations (Hadfield and others 1986) to favor western larch in areas where root diseases are causing mortality.

The remaining species of decay fungi that were recovered normally are saprophytic wood decomposers. Most of the decay found in larch stumps was caused by either *Fomitopsis pinicola* (Swartz ex Fr.) Karst. or *Trichaptum abietinum* (Dicks. ex Fr.) Ryv., which occasionally were found fruiting on stumps. Estimates of the percentage of stumps decayed by *F. pinicola* and *T. abietinum* based on presence of conks or positive isolations probably are conservative (table 1) because decay resembling that caused by *F. pinicola* was found in an additional 26 percent of stumps in both stands. Decay resembling that caused by *T. abietinum* was found in an additional 44 percent of the stumps. *Fomitopsis pinicola* and *T. abietinum* were the most common decay fungi found in fire-killed Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco) in western Oregon and Washington (Kimmey and Furniss 1943) and in several conifer species in California (Kimmey 1955). Blanchette and Shaw (1978) reported that *T. abietinum* and *Trametes versicolor* (L. ex Fr.) Pilat can significantly increase decay of coniferous slash in northern Idaho.

Other decay fungi identified from larch stumps in this study were *Resinicium bicolor*, *Antrodia serialis* (Fr.) Donk, *Coniophora arida* (Fr.) Karst., *Serpula himantiodes* (Fr.) Karst., *Stereum sanguinolentum* (Alb. et Schw. ex Fr.) Fr., and *Wolfiporia cocos* (Wolf) Ryv. et Gilbn. (table 1).

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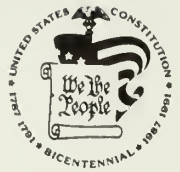

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